

NON-PUBLIC?: N
ACCESSION #: 8711050146
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Hope Creek Generating Station PAGE: 1 of 5

DOCKET NUMBER: 05000354

TITLE: Safety/Relief Valve (SRV) Failure to Close - Sand Blasting Grit in Solenoid

EVENT DATE: 10/10/87 LER #: 87-047-00 REPORT DATE: 11/09/87

OPERATING MODE: 2 POWER LEVEL: 010

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: A. M. Ervin, Lead Engineer - technical TELEPHONE #: 609-339-5239

COMPONENT FAILURE DESCRIPTION:

CAUSE: F SYSTEM: SB COMPONENT: RV MANUFACTURER: G020

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT: On October 10, 1987 at 1950 hours, the Plant was in OPERATIONAL CONDITION 2 (Startup/Hot Standby) at 10% power generating 0 MWe when the "J" SRV failed to close on signal. The SRV had been opened during a test which was being performed to collect baseline data for the acoustic monitors. The reactor was scrammed manually at 1952 hours in accordance with the HCGS abnormal operating procedures. Procedures to place the unit in cold shutdown were executed. The root cause of this occurrence was determined to be sand blasting grit in the solenoid valve. Corrective actions included replacement of the malfunctioning Target Rock valve and inspection of a sampling of the solenoids of other SRVs.

(End of Abstract)

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PLANT AND SYSTEM IDENTIFICATION

General Electric - Boiling Water Reactor (BWR/4)
Main Steam System (EIS Designator:SB)

IDENTIFICATION OF OCCURRENCE

Safety/Relief Valve (SRV) Failure to Close - Sand Blasting Grit in Solenoid.

Event Date: October 10, 1987

Event Time: 1952 hours

This LER was initiated by Incident Report No. 87-158

CONDITIONS PRIOR TO OCCURRENCE

The Plant was in OPERATIONAL CONDITION 2 (Startup/Hot Standby) at 10% power generating 0 MWe.

DESCRIPTION OF OCCURRENCE

On October 10, 1987 at 1950 hours the "J" SRV failed to close on signal. The SRV had been opened during a test which was being performed to collect baseline data for the acoustic monitors. The reactor was scrammed manually at 1952 hours in accordance with the requirements of Technical Specification 3.4.2.1.b and the HCGS abnormal operating procedures. Procedures to place the unit in cold shutdown were executed.

APPARENT CAUSE OF OCCURRENCE

The root cause of this occurrence was determined to be sand blasting grit in the solenoid valve.

ANALYSIS OF OCCURRENCE

The transient caused by the failure of the "J" SRV to close started at nearly equal to 770 psig and 507 degrees Fahrenheit. Immediately following the manual scram, the vessel narrow range level reached 10" and a Level 3 Scram signal was received. During the subsequent refilling of the vessel, a narrow range level of 60" was reached, generating a Level 8 scram signal at 54". The Level 8 scram signal caused a main turbine trip and "A" and "C" Reactor Feed Pump Turbine trips. At the time of these trips the Reactor pressure had been reduced to 700 psig. Vessel level control was established using the "B" Secondary Condensate pump and was stabilized between 30" and 50". Condenser vacuum was controlled by the mechanical vacuum pumps. All steam line drains were closed to limit the cooldown rate.

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ANALYSIS OF OCCURRENCE (CONT.)

The main concern during the first hour of the transient was to limit the vessel cooldown rate. During that time the moderator temperature decreased from 507 degrees Fahrenheit to 324 degrees Fahrenheit. This cooldown rate of 183 degrees Fahrenheit/hour exceeded the Technical Specification limit of 100 degrees Fahrenheit/hour.

General Electric was requested to perform the engineering evaluation required by the Action Statement of Technical Specification 3.4.6.1. The engineering evaluation provided by General Electric was reviewed and approved by the HCGS Station Operations Review Committee (SORC). This report indicates that the excessive cooldown rate raises two basic structural concerns: (1) brittle fracture and (2) allowable stress and fatigue. These concerns were resolved as follows:

The temperatures experienced by the vessel during the transient were much greater than the limits shown on Figure 3.4.6.1-1 of the Technical Specifications and therefore the transient created no concern regarding possible brittle fracture of the vessel.

The transient created some cooldown stresses in the vessel components. However the limiting cooldown rate of 100 degrees Fahrenheit/hour is intended to apply only to manually initiated temperature changes, such as those which occur during normal startup and shutdown. The limit does not apply to unanticipated transient stresses which are evaluated in the Reactor vessel stress report. An evaluation of the design basis for the single relief valve blowdown (SRVB) determined that the maximum stresses due to a cooldown of 151 degrees Fahrenheit in ten (10) minutes, or a rate of 906 degrees Fahrenheit/hour, are acceptable. The transient experienced by the HCGS vessel components was less severe than that determined to be acceptable in the SRVB analysis and therefore created no unacceptable vessel stresses. The contribution of the HCGS transient to the vessel components fatigue is also bounded by the SRVB analysis and it is therefore concluded that no unacceptable vessel component fatigue occurred.

General Electric therefore concludes in this engineering report that there are no structural integrity concerns with the restart of HCGS.

The malfunctioning SRV was removed from service and replaced by another of the same manufacture (Target Rock) and model. The valve was sent to Wyle Laboratories for investigation of the cause of failure of the valve to close. PSE&G and General Electric personnel participated in this investigation. The

ANALYSIS OF OCCURRENCE (CONT.)

conclusion of this investigation is that the failure of the valve was caused by sand blasting grit in the solenoid valve.

In 1985-86, prior to fuel loading, sandblasting was used to clean damaged areas of the containment inner surface prior to touchup resurfacing. Vacuum particle capture techniques were used to minimize the contamination of equipment.

Since the cause of the "J" SRV failure was not initially known, as a precautionary measure, a walkdown of all SRVs to identify any other deficiencies such as bent tubing or loose connections was made prior to restart. After a review of the transient by SORC on October 11, 1987, plant restart was authorized.

The pressure/temperature parameters of this transient will be added to the HCGS Vessel Cyclic Duty Monitoring database.

A similar event occurred on October 6, 1986 during startup testing of HCGS. The "H" SRV failed to close after being manually opened to reduce vessel pressure and permit shutdown cooling to be placed in service. An uncontrolled blowdown from nearly equal to 80 psig occurred, however the Technical Specification cooldown rate limit was not exceeded. The failure to close to the "H" SRV was caused by a bent outboard solenoid valve.

A review of the NPRDS database indicates that there have been a number (nearly equal to 200) of occurrences of malfunction of Target Rock valves of the same model number as the HCGS SRVs, however none of them appear to have been due to foreign material in the solenoid. Many of the causes of failure of Target Rock valves in the past have been addressed by General Electric in SIL 196 and its subsequent revisions and addenda. All of the recommendations of SIL 196 which were applicable to the HCGS SRVs have been implemented.

Had this transient occurred during full power operation, the initial vessel temperature would have been higher and the cooldown rate would have been more severe. However, the SRV analysis would still have been bounding since full power operation was assumed in the definition of this event. For these reasons the health and safety of the public was not compromised by this event.

This report is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv).

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CORRECTIVE ACTIONS

1. The malfunctioning SRV was replaced from stores, retested and determined to be functional. The remaining SRVs were visually inspected for damage.
2. Two sets of solenoid valves near "J" SRV and a random set from a SRV on the opposite header were disassembled and inspected for signs of sand blasting grit intrusion. No evidence of such intrusion was found.

Sincerely,

/s/ S. LaBruna
General Manager
Hope Creek Operations

AME:

SORC Mtg. 87-158

ATTACHMENT # 1 TO ANO # 8711050146 PAGE: 1 of 1

PSE&G

Public Service Electric and Gas Company P.O. Box L Hancocks Bridge,
New Jersey 08038

Hope Creek Operations

October 29, 1987

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

Dear Sir:

HOPE CREEK GENERATING STATION
DOCKET NO. 50-354
UNIT NO. 1
LICENSEE EVENT REPORT 87-047-00

This Licensee Event Report is being submitted pursuant to the requirements of 10CFR50.73(a)(2)(iv).

Sincerely,

/s/ J. Nichols
for S. LaBruna
General Manager
Hope Creek Operations

AME:

Attachment
SORC Mtg. 87-158

C Distribution

The Energy People

*** END OF DOCUMENT ***
